

CAPPING LAYER FOR EXTREME LOW DIELECTRIC CONSTANT FILMS**ABSTRACT OF THE DISCLOSURE**

Specific embodiments of the invention provide a silicon-carbide-type or silicon oxycarbide (also often called carbon-doped-oxide [CDO] or organosilicate glass) capping material and method for depositing this capping material on ELK films which are used as a dielectric material in integrated circuits. The ELK film may include any ELK film including but not limited to inorganic, organic and hybrid dielectric materials and their respective porous versions. The silicon-carbide-type material may be an amorphous silicon carbide type material such as the commercially available BLOk™ material, or a carbon-doped oxide material such as the commercially available Black Diamond™ both of which are developed by Applied Materials of Santa Clara, Ca. The amorphous silicon carbide (a-SiC) material is deposited using a plasma process in a non-oxidizing environment and the CDO-type material is deposited using an oxygen-starved plasma process. The non-oxidative or oxygen-starved plasma processes do not significantly degrade the underlying film's chemical and electrical properties. The CDO material offers the advantageous property of having a lower dielectric constant value of less than 3.5 as opposed to the a-SiC material which has a dielectric constant of approximately 4.5. The CDO material besides, having a lower dielectric constant also has a superior adhesion characteristics to the underlying ELK material. However, experiments have indicated that despite its higher dielectric constant, the a-SiC-type material (e.g. BLOk™) may be used to generate capped ELK films with similar or even reduced dielectric constants relative to lower k capped films, and may provide composite (i.e. ELK+cap) structures exhibiting superior k stability.